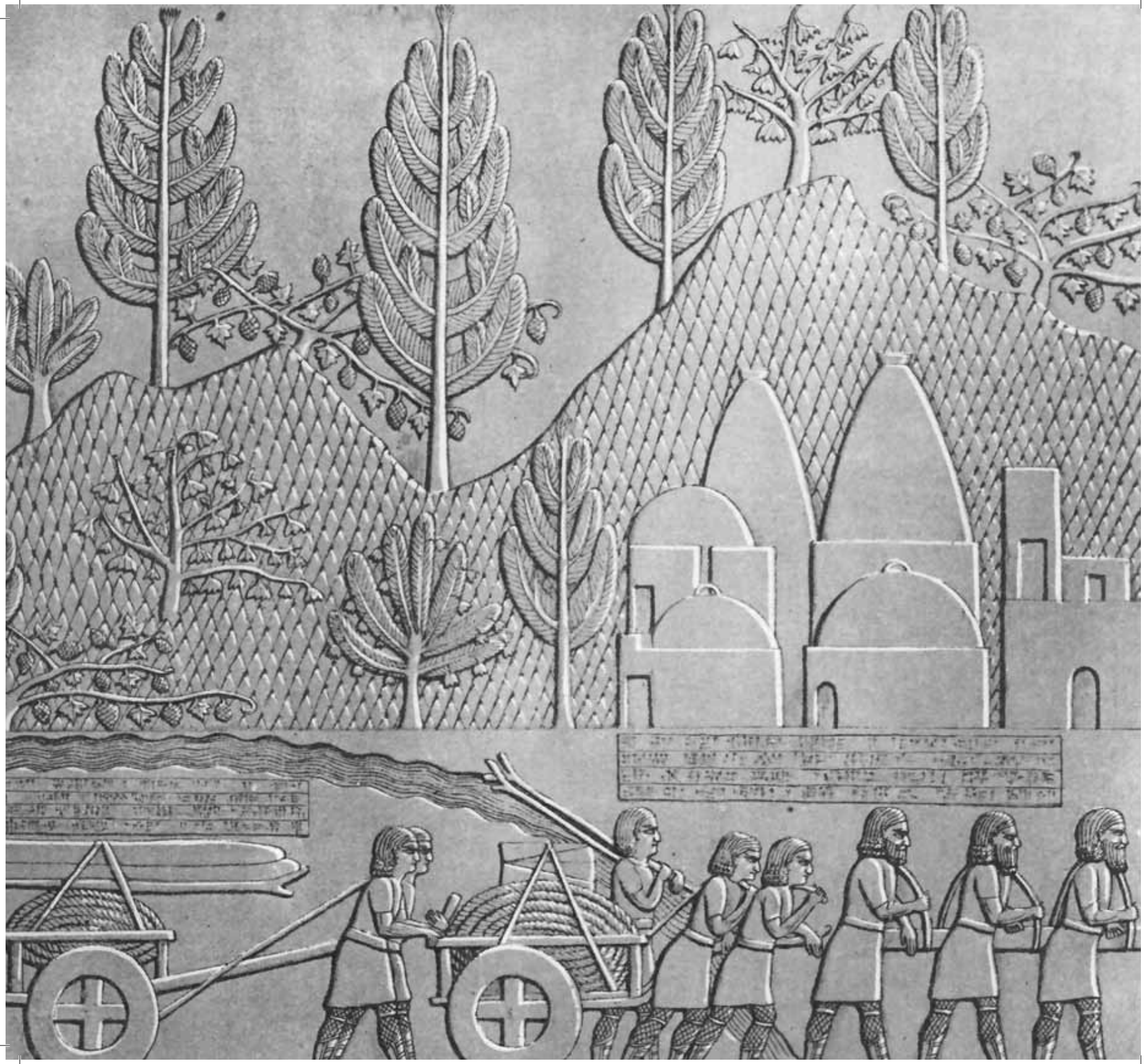
Earthen Domes and Habitats. Villages of Northern Syria


ARCHAELOGY OF
CORBELLED DOMES



The corbelled dome in the archaeology of the ancient Near East

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Domes constitute the upper part of buildings. Excavations of structures on Near Eastern sites are, however, frequently limited to the lower parts of walls. Exceptionally, the remains of collapsed superstructures can be recovered from the interior of buildings.

The way in which a building could have been roofed is consequently the result of an interpretation of architectural remains in relation to the available technical possibilities. These can be found firstly in the archaeological record. Secondly, ethno-archaeological studies on the traditional architecture of the Near East have led to an increase in the number of possible hypotheses (Aurenche 1992).

Technological evidence in archaeological and iconographical documentation

Even though stone is occasionally used, unfired mud brick is the principal building material for ancient Near East architecture. Unfired bricks make their appearance in a modelled form in the Pre-Pottery Neolithic A around 8000 BC. By 7500 BC, during the Pre-Pottery Neolithic B, the first moulded bricks are produced (Sauvage 1998, pp. 87-102). It is this particular material which has lent itself to the construction of arches, vaults and domes up to the present day.

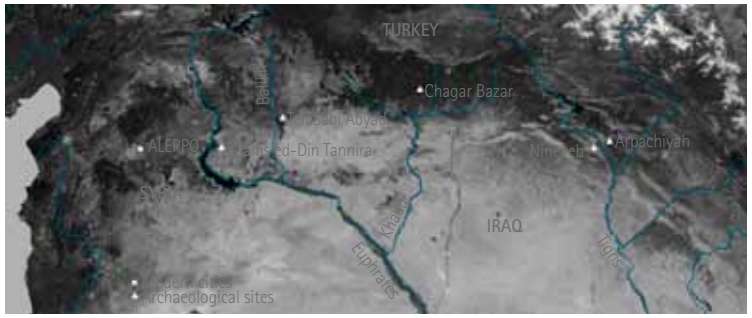
The technology of the vault appears to have been quickly mastered in the ancient Near East. Corbelled domes and barrel vaults were used in the construction of subterranean tombs in Ur in Southern Mesopotamia dating to the third millennium BC (Woolley 1934, pp. 228-237; Besenval 1984, pp. 164, pl. 107-108). From this moment on, the building technique is applied rather frequently in the ancient Mesopotamian architecture as it avoids the use of wood, a rare commodity in that region, in the roof structure (Novàk & Schmid 2001). We can therefore consider the use of the vault as the first phase prior to the mastering of the domed building technique.

As far as we know, not a single decisive piece of evidence for roofing in the shape of a dome has been found by excavations in the Near East. This could be the result of coincidence concerning the archaeological finds, but is probably also caused by a lack of careful observation during excavations. We can confirm with almost certainty that the dome was used as a method of roofing in at least certain parts of the ancient Near East. In fact, we can in this respect mention one example of iconographic evidence. A Neo-Assyrian relief, recovered at Nineveh (Fig. 1), dating from the reign of the Assyrian king Sennacherib (704-681 BC), represents a scene of wood transport (Layard 1853, pp. 3, pl. 17; Patterson 1915, pp. 19-20, pl. 119; Besenval 1984, pp. 117-118, pl. 147). In the background several domed buildings are depicted (Fig. 2), the shape of which is very much comparable to those known today.

Buildings probably covered with domes in the archaeological record

As has been mentioned above, excavations uncover generally only the lower part of buildings, so the reconstruction of the roof in the shape of a dome can only be made on the basis of the ground plan. Present traditional houses provided with domes, display a ground plan which is either square or circular. As a result, we can assume that ancient architectural units with a circular or square plan could have been covered with a dome.

Fig. 1: Map of Syria and northern Iraq with the sites mentioned in the text.



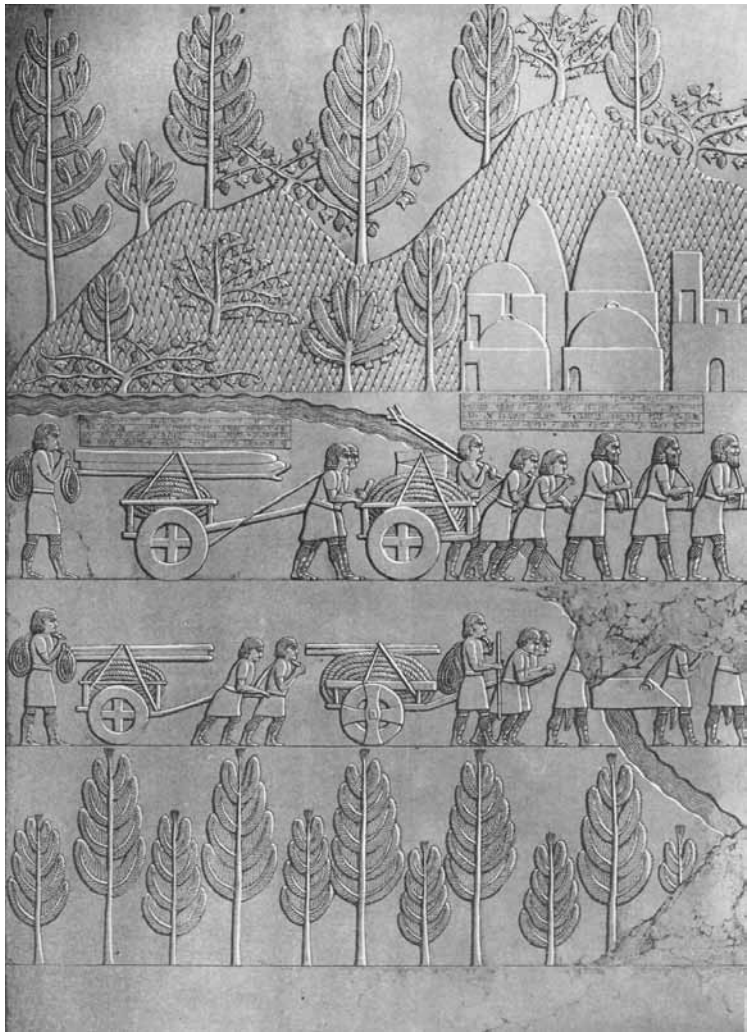


Fig. 2: Relief from the palace of Sennacherib at Nineveh showing the representation of houses with domes (After Patterson 1915, pl. 119).

In the archaeological record, the earliest constructions for which scholars have proposed a reconstruction with a dome-shaped roof date to the Halaf period, which corresponds to one of the latest phases of the Neolithic in the Near East (c. 5900-5300 BC). It concerns houses with a circular ground plan of which the diameter can reach up to six metres and which are sometimes attached to a structure displaying a quadrangular plan. Structures of this type were identified for the first time with certainty at Arpachiyah in Northern Iraq (Mallowan & Rose 1935). They were nominated "tholoi" and for the part of the structure equipped with a circular plan, a roofing of a corbelled dome was put forward (Fig. 3).

Since then, many houses of this type were brought to light in the whole area covered by the Halaf culture, stretching from the Mediterranean to the Iranian plateau including Southeast Anatolia. Amongst the important sites which have produced remains of the Halaf period, we must mention Tell Sabi Abyad on the river Balikh in Syria (Verhoeven & Kranendonk 1996, pp. 61-62, 76-77, fig. 2.5). The reconstruction proposed for the structures with a circular plan of Tell Sabi Abyad is a cropped corbelled dome finished with a flat roof (Fig. 4). A similar roof reconstruction (Fig. 5) is suggested for circular houses at Shams ed-Din Tannira (Seeden 1982, pp. 74-75, fig. 79). Comparable structures are still known in present-day northern Syria.

Until recently, these reconstructions have remained rather hypothetical, even though they are based on the technical possibilities acquired during the period concerned and on analogies with traditional modern constructions.

Circular structures at Chagar Bazar

The evidence gathered during the excavations at Chagar Bazar since 2001, represents an important contribution to the reconstruction of the roofing of Halaf circular houses. Excavations were undertaken between 1935 and 1937 at Chagar Bazar by M. Mallowan (Mallowan 1936). A deep sounding of the tell demonstrated that the site had been occupied throughout the complete Halaf period. Recent excavations, resumed in 1999, confirmed Mallowan's observations, whereas his conclusions were improved upon (Tunca & Baghdo 2006).

Since 2001, several structures with a circular plan have been discovered in Area F. The walls in mud bricks were preserved up to several rows, but an important observation was made in the case of two houses: the surface of the upper row of bricks proved to show a slight inclination towards the interior of the structure. This inclination is very likely to correspond to the rows of bricks forming the base of a corbelled dome.

More important, nevertheless, were the remains recovered from the interior of a large circular structure discovered in 2006. The diameter of this house measures around six metres. The walls have a thickness of 0.65 metres and are preserved up to 0.80 metres in height. The structure had been destroyed by fire and the complete roofing had collapsed into the interior of the building (Fig. 6). It was possible to detect in the debris a succession of some building materials which originally formed the roof. The top of the debris consisted

Fig. 3: Reconstruction of a Halafian circular structure provided with a corbelled dome at Arpachiyah (After Mallowan & Rose 1935, fig. 8).

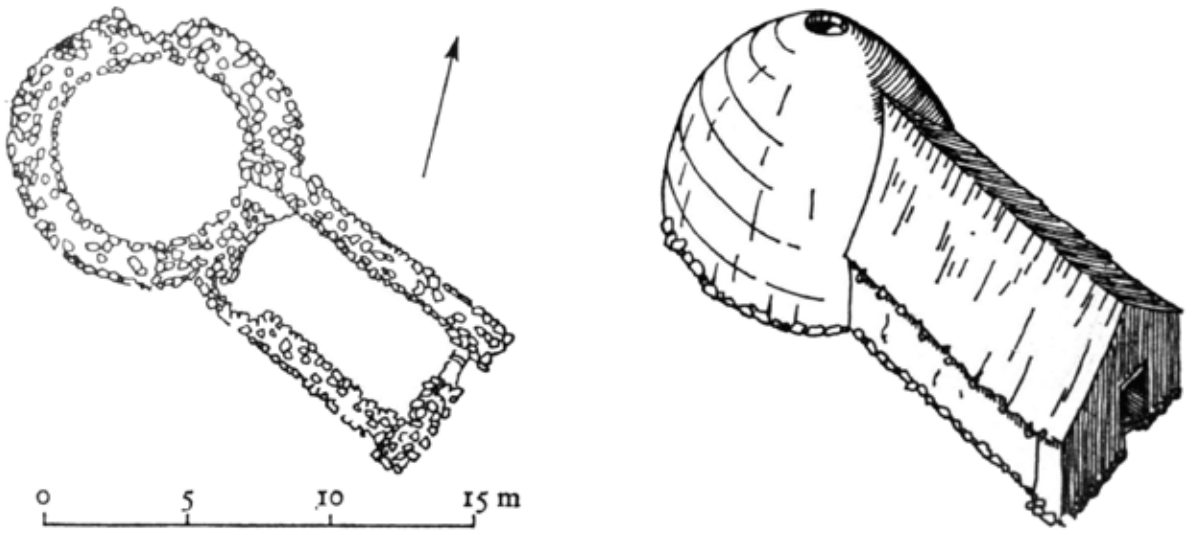


Fig. 4: Reconstruction of Halafian circular structures with a flat roof at Tell Sabi Abyad (After Verhoeven & Kranendonk 1996, fig. 2.5).

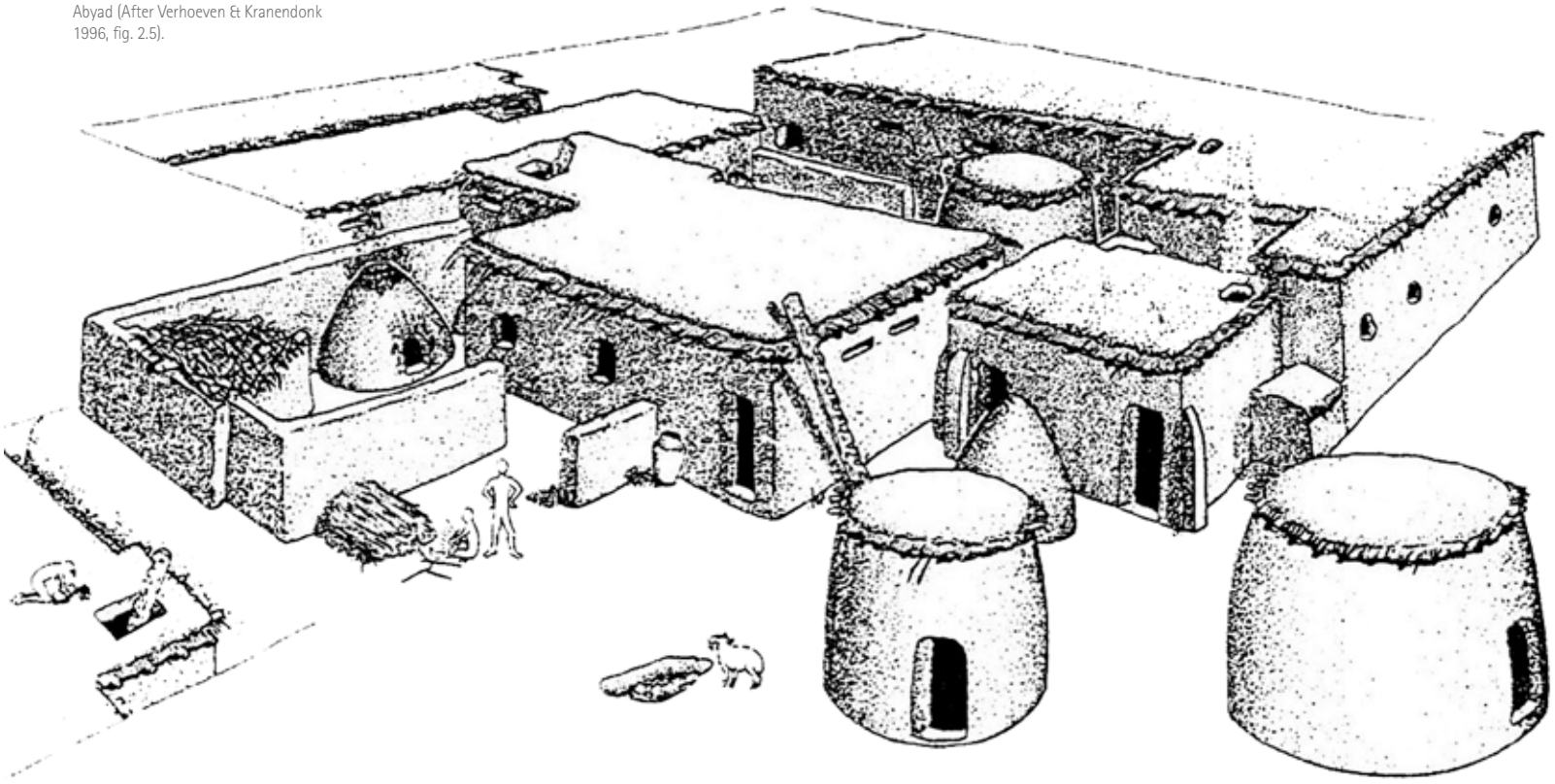


Fig. 5: Reconstruction of a Halafian circular house with a flat roof at Shams ed-Din Tannira (After Seeden 1982, fig. 79)

of slabs of mud of about 10 centimetres thick, which doubtless represented the top of the roofing. These slabs were deposited onto a layer of charred thatch. These building materials are similar to those used nowadays in the construction of flat roofs in traditional mud brick architecture. Even though the excavation has not revealed up till now remains of wooden beams, the evidence points towards a building covered with a flat roof. We can therefore imagine the roofing of this circular structure as a combination of a half-corbelled dome finished with a flat roof.

The reconstruction proposed for the Halaf houses at Tell Sabi Abyad and Shams ed-Din Tannira finds some confirmation here. However, it remains possible that certain circular houses with a more limited diameter could have been provided with a complete dome.

Excavations of the 2009 campaign on Area I revealed a circular structure dated to the Middle Bronze Age (c. 18th century BC). This structure of unfired mud bricks, measuring 4 by 4 meters, is covered with a corbelled dome, partly preserved up to the closing rows of slightly inclined bricks (Fig. 7). Its size and ashy fill points towards a function as a kiln or furnace, but further investigation is necessary to clarify its use and interior construction.

Conclusion

The Halaf examples demonstrate that the technique of the corbelled dome could have been mastered as early as the sixth millennium BC. It is therefore reasonable to assume that this technique was also employed during later periods. The fact that the use of this technique cannot to this day be confirmed by archaeological remains is most likely due to the lack of pertinent observation in excavations. One can only hope that future excavations will provide us with clear archaeological evidence for the use of the dome in the ancient Near East.

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Fig. 6: A Halafian circular structure with the remains of the burned and collapsed roof on Area F at Chagar Bazar (Photo Joint Expedition to Chagar Bazar, 2008).

Fig. 7: A circular structure with the remains of a corbelled dome dated to the Middle Bronze Age (c. 18th century BC) on Area I at Chagar Bazar (Photo Joint Expedition to Chagar Bazar, 2009).

Prehistoric dome architecture in the Aegean

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The architecture that developed in the Aegean islands and on the Greek mainland from earliest times and prevailed throughout the prehistoric era was based on a rectangular plan and a post-and-beam system. Stone was the most popular building material in the rocky islands, but mud bricks were also used in certain regions where clay deposits were available. Timber, finally, played an important role as a means to reinforce the walls, especially in the later Bronze Age periods.

The circle and the rectangle

There are of course exceptions to this general rule. The all-purpose primordial hut, for example, on a round or elliptical plan, made of perishable materials such as wood and reeds, is a common feature of most human landscapes; this timeless, ephemeral structure is still present in the Greek countryside today. But the real 'exceptions', standing out among the rectangular buildings in a very powerful manner, are the domed circular buildings made of stone that appear in the Aegean as early as the end of the third millennium BC. They are almost exclusively funerary in function. The houses of the dead are thus distinguished from those of the living, and death is celebrated through the exclusive use of the circle.

The choice of form in architecture is surely not arbitrary. The rectangle is a dynamic form, with distinct orientation and proportions, and may easily evolve into something else by expanding one or more of its sides or through the accretion of more rectangles, both horizontally and vertically. It thus facilitates the construction of an upper floor, present in the Aegean as early as the end of the third millennium BC.[1] The circle, on the other hand, has no orientation other than the axis at its centre, a kind of 'axis mundi', and the direction of the break of the circle at the entrance; all its parts are equal in relation to the center and it is a passive form in the sense that it cannot easily evolve into something different (when circular units are attached to each other they still retain their autonomy). The circle is indeed a powerful emblematic form in many ways, alluding to archetypal forms such as the cave, the womb and Heaven. Naturally, such interpretations may be challenged as interpretations by our modern minds that should not be projected to a remote past. However, regardless of what the prehistoric peoples of the Aegean were thinking when putting aside the circle for funerary use only, there is no doubt that there was a deliberate act of choice and distinction and it is therefore significant in its own right.

Circular buildings of a non-funerary function are not entirely absent in the Aegean, but they are very limited and ambiguous in form. Round structures, for example, are found in the West Courts of the Minoan palaces of Knossos and Phaistos, as well as the public court of the settlement of Pyrgos, all dated to the Middle Bronze Age. They are cylindrical in form, dug underground, and functioned most probably as storage spaces, as kind of silos, though other functions have also been suggested.[2] At the palace of *Mallia* there is a double row of eight round buildings, all of the same diameter (approx. 4 meters) that seem to have had a similar function.[3] They differ, however, in that they are built above ground (Fig. 1). Only the lower part of the walls survives, with no indication of a door, and five of them had a central pillar to support the roof. The form of their superstructure is unknown, but it is often assumed that they were domed. It is important to emphasize that this is a unique case of a circular, pos-

[1] Upper floors are attested at the Early Cycladic settlement of Scarkos on the Island of Ios (Μαρθάρη 1997, pp. 362-382) and remained a typical feature of Aegean architecture throughout the Bronze Age.

[2] Cadogan, for example, believes that at least one is a cistern (Cadogan 2006, pp. 447-456).

[3] See Tiré & van Effenterre 1983, pp.8-9. Preziosi points out similarities between the Mallian silos and those found in Egypt and the possibility of an influence from Egypt (Preziosi 1983, pp. 108-9).

Fig. 1: The Palace of Mallia, aerial photo. Circular structures (grain silos?) built above ground (bottom left).

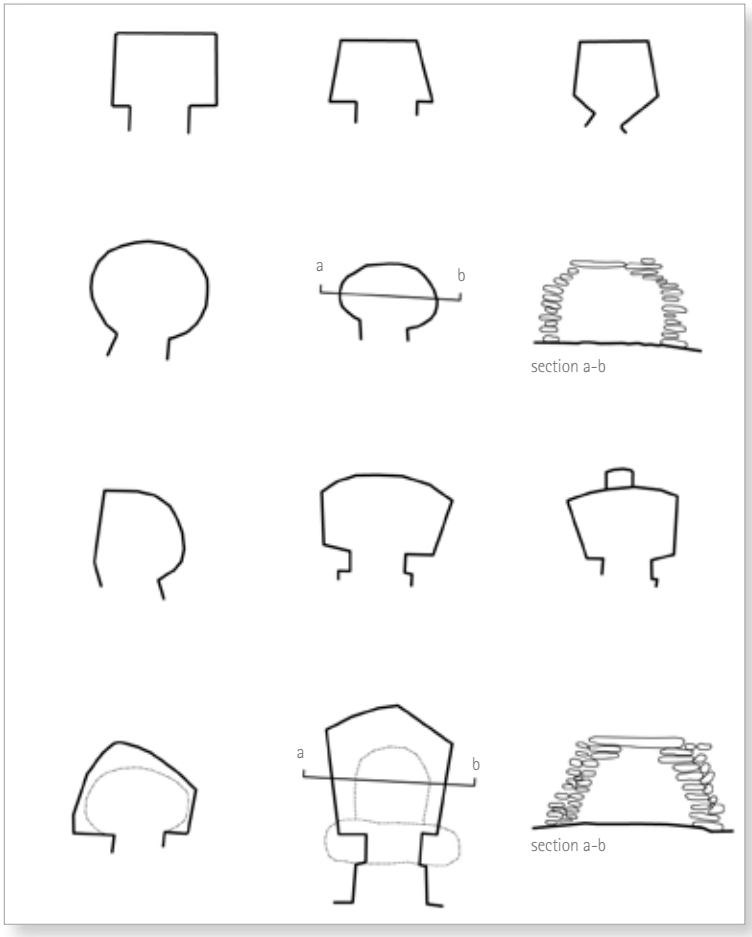


Fig. 2: Early Cycladic corbelled graves at Syros (after Tsountas)

sibly early domed, building that is not a tomb. Throughout the Aegean and the Greek mainland, from the earliest periods to the very end of the Bronze Age, it is in funerary architecture that the circle triumphs and with it, most probably, the dome or *tholos* as it is commonly referred to in Greek. Both words are Greek: 'dome' is a house concept, regardless of the form, whereas 'tholos' refers to a building with a circular plan, regardless of function.[4] The examples known from excavations are numerous and are presented here in three groups, corresponding to the three cultural entities that prevailed in the Aegean during the Neolithic and the Bronze Age periods. The overview that follows gives an insight into the formal and structural peculiarities of each group but also provides the basis for a final discussion regarding the three main questions that have tantalized scholars and experts in this field: form, structure and diffusion patterns. Function, at least, is the only issue beyond any reasonable doubt.

[4] Liddell H.G. & Scott R.

Early Cylcadic corbelled graves

Early Cycladic cemeteries are numerous and though severely plundered comprise the main source of information on this culture.[5] Tombs are, as a rule, rectangular or trapezoidal cists built of upright slabs, but on the island of Syros there is a local type of small tomb of roughly circular shape (Fig. 2). They consist of a subterranean pit lined with stones up to a certain height and roofed with a corbelled structure. The opening on the top is closed with a capstone. There is a small doorway and a short entrance passage. There are, however, hardly any well-documented drawings of these structures and the technical descriptions available in the bibliography (mostly preliminary reports) are rather sparse.

The examples of this type are few and localized and one may even dispute the concept of a true circular structure altogether, since the lower part is often roughly trapezoidal in shape. However, the use of the corbelling technique as a means to provide a shelter is undisputable and in that sense it is among the earliest attested in the Aegean (around 2300 BC).

The Early, Middle and Late Bronze Age circular tombs in Crete

Crete is a very large island and the excavations have brought to light a large amount of cemeteries and tombs. There are two major types of tomb construction, both built above ground: the circular and the rectilinear – the latter has been labeled 'house tomb' precisely because of its affinities to house architecture. Circular tombs are concentrated in the southern region of the island, in the Messara plain, and have puzzled scholars for years now as to their complete form and their origin (Fig. 3).[6]

The building technology applied for the construction of these circular tombs and their overall form is one of the most heated issues in the academic debate, and one that may never be resolved since none has survived intact.[7] The walls are founded on the bedrock and consist of field stones and mud plaster (Fig. 4). Larger stones or boulders are placed along the interior face of the wall and wedged with smaller ones (wedging seems to be an important factor for the stability of the structure). In some instances there are small walls perpendicular to the outer face of the wall jutting out not more than a meter. Though they look like buttresses, they are too thin and flimsy to act as such. In earlier tombs doors often face in an easterly direction and are very low, under one meter. These structures are seldom free-standing; there are annexes attached to the circular building, usually at the eastern side, consisting of a group of rectangular rooms, serving most probably ritual purposes.

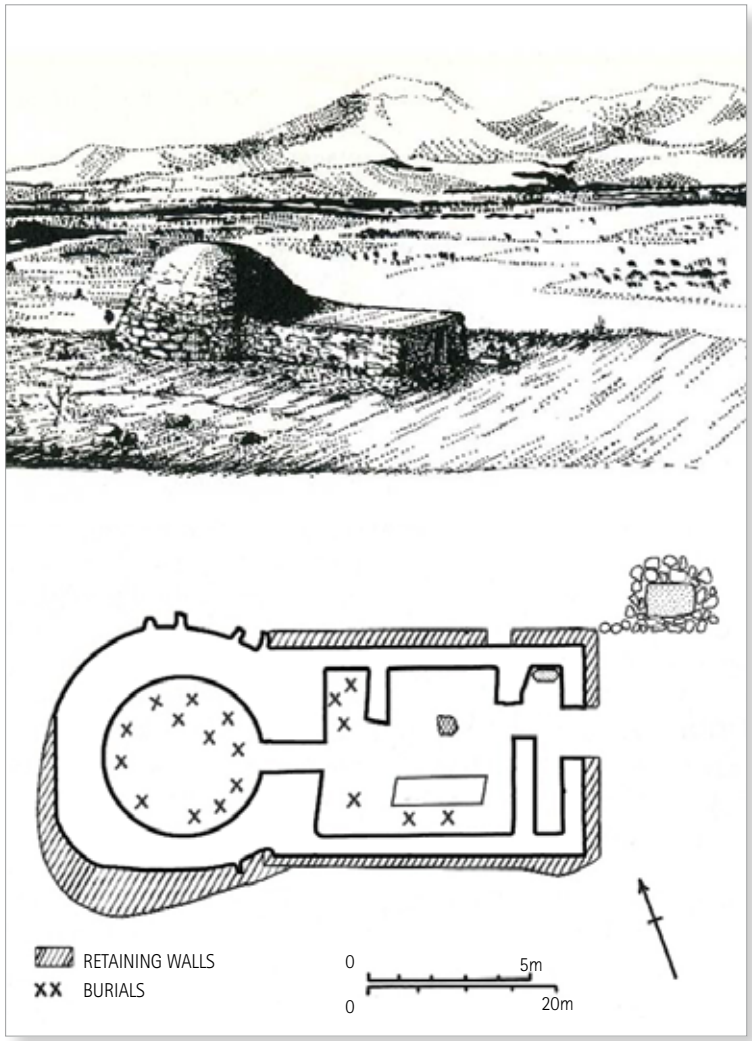


Fig. 3: The circular tomb at Apesokari, Messara, Crete and its annexes; a hypothetical representation of a domed upper structure (after Hood).

[5] See Barber 1987, pp. 74-80.
[6] See Branigan 1970.
[7] See Cavanagh & Laxton 1982, pp. 65-77.

The tombs vary greatly in size. The largest is tomb A at Platanos (18 meters exterior diameter, Fig. 5). In several cases, approx. 30 tombs, the walls survive high enough to show that corbelling was involved, an indication for most scholars that the upper part of the tomb was in the form of a vault. This is further suggested by the large quantity of stones found within the debris of the tomb during excavation (Branigan estimates a volume of 90 cubic meters for a tomb at Kamilari, 7.54 meters in diameter, sufficient to provide a vault). The problem however lies with the larger tombs, such as Platanos A, that tend to have relatively thin walls, in which case a vault would be improbable. It has been suggested that these were covered with a light timber roof supporting brush or reeds. In at least one case, at Kamilari, there is evidence of burnt wood among the debris. For the smaller tombs many scholars believe that they had the form and construction of the Cretan *mitata* (see M. Arakadaki, this volume).

Chronologically, the circular tombs belong to the Middle Bronze Age. Recent finds, however, have changed the picture: the earliest examples date back to the EM I – Krasi, Nea Roumata, Ayia Photia and Archanes. These tombs are earlier than the few Cycladic types discussed above and are all found outside the Messara region. For some scholars they provide a link with the past and they are, in other words, the predecessors of all circular funerary architecture in the Aegean and on the Greek mainland.

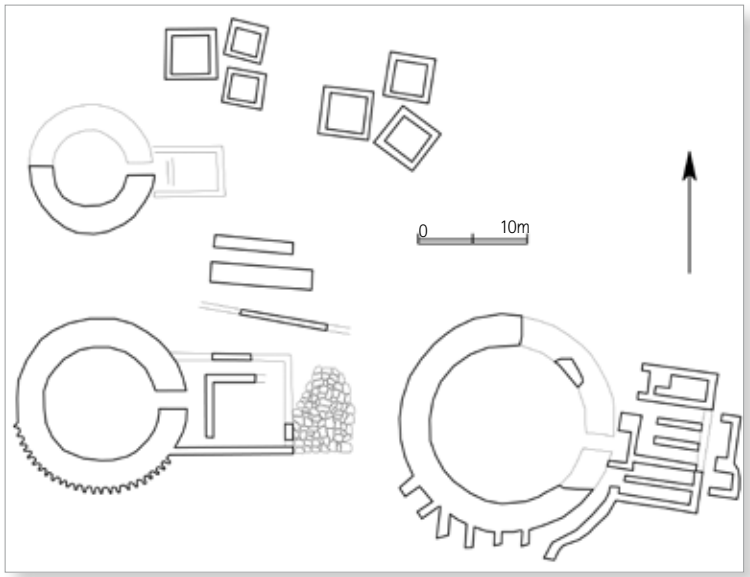
Branigan, in reassessing the 'circular arguments' for the origins of the Messara burial type,[8] rules out any influence coming from cultures outside the Aegean, such as the vaulted round houses of Khirokitia in Cyprus, of the Neolithic period. Nearer home, he emphasizes the continuity of the Cretan culture. Evans and Xanthoudides believed that the tombs were built as imitations of the houses of the living (the hut?); but then again, the rectilinear form prevails in Crete throughout its history. Finally, Branigan suggests that the *tholos* may be an artificial alternative to the natural caves used for burials in the Early Minoan period.

As to their function, circular tombs were in use for long periods of time and contain multiple burials, whereas 'house tombs', as the term implies, were used for family burials. The question, to my understanding, is why some of the inhabitants of Crete chose to emphasize the difference with the living, whereas others chose to do exactly the opposite by using emphatically a 'house' form to shelter their dead. Differences in the attitude towards the dead are differences in ideology and are therefore of great significance.

[8] See Branigan 1993.

Fig. 4: The circular tomb of Kamilari, Crete.

Fig. 5: The cemetery of Platanos, Crete (after Branigan).



From the circle to the dome: the Late Bronze Age Mycenaean tholos tombs

Life on the Greek mainland during the Neolithic and the early periods of the Bronze Age seems to have followed a parallel, though different, trajectory to that of Crete. By the end of the era, following the fatal events

Fig. 6: The Lion Tomb: one of the nine tholos tombs in the vicinity of the Mycenaean acropolis.

that ended the prosperous life in the palaces and the settlements of Crete, the people of the mainland, especially Peloponnesus and central Greece, take over power in the Aegean region and beyond. A new era of prosperity begins for the Mycenaean people, based on trade and seafaring that soon expands beyond the territories already explored by the Minoans in the Eastern Mediterranean and, for the first time, towards the West also, as far as Spain.

The Mycenaeans have their own architectural traditions, and although they gradually become highly influenced by the Minoan culture they retain their distinct character. The circle is not part of the traditional architectural vocabulary of the mainland, except for funerary practices, this they have in common with the islanders. They also have in common, as do most cultures universally, the omnipresent and timeless hut made of organic materials and based on the circular plan.

One of the earliest uses of the circle, before it is used for a true edifice, is in the form of a circular platform, at the cemetery of Lefkadia, dated to the Early Helladic II period (2400-2300 BC).[9] The cemetery consists of several such platforms that include cist burials. These were covered over with earth forming *tumuli*, a burial custom quite popular in the broader area of Southeastern Europe. The construction of *tumuli* probably continued throughout the Middle Helladic period, though the finds are rather sporadic and not always convincing. During this period however, new types of burial practices appear and by the Late Helladic period, the Mycenaeans had developed a variety of tomb types aside from the cist, such as the shaft grave, the rock-

[9] See Branigan 1975, pp. 37-49.

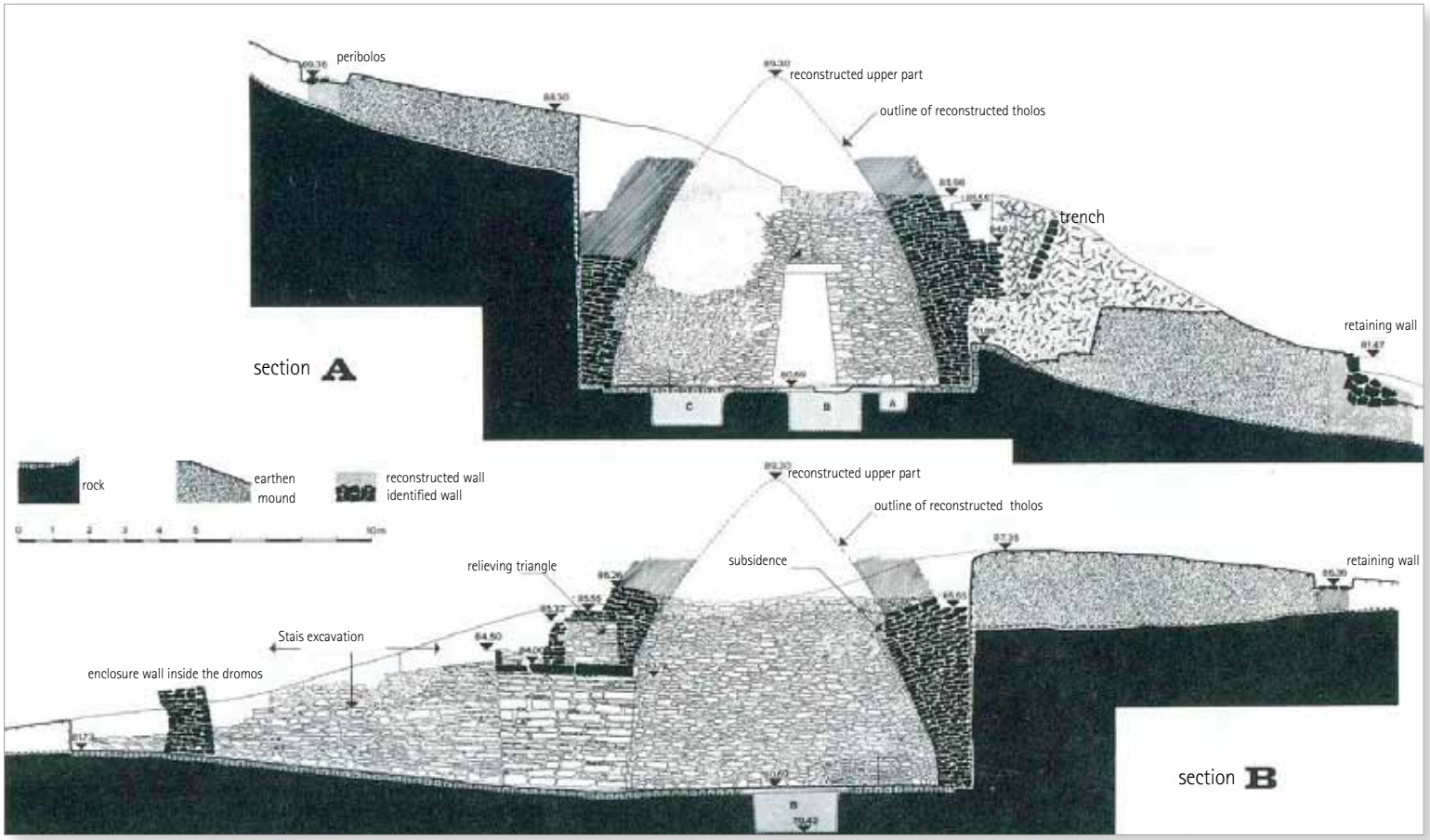


Fig. 7: The tholos tomb at Thorikos, Attica (after H. Gasche and J. Servais).

cut chamber and, most impressive of all, the *tholos* tomb, a type that became popular during the period 1500-1300 BC.

The first *tholoi* were excavated by Schliemman in 1876 at Mycenae. It was Wace, however, who dug systematically and studied the nine tombs in the vicinity of the acropolis of Myceneae, between 1920 and 1925 (Fig. 6). He consequently published the first detailed description of these tombs with drawings by Piet de Jong and arranged them chronologically in three types based largely on technological and morphological differences.[10] Meanwhile, more *tholoi* were coming to light and it soon became obvious that the three types Wace cautiously proposed were of little value[11] (Fig. 7). Hood published an overview of the *tholos* tombs, in 1960.[12] Pelon's work, however, published in the late 1970s, is to this date the most comprehensive compilation of the Mycenaean *tholoi* of the Greek Mainland (he mentions more than 116).[13]

Scholars dealing with Mycenaean *tholoi* have been concerned with three main questions: a) their date of construction, b) the technology that ensures their stability and c) the origins of this type of structure. They are also concerned, of course, with burial customs and their social significance. Before we proceed to discuss these issues we shall first attempt a general

[10] See Wace 1921-23.

[11] For an insight to this matter see: Galanakis 2007, pp. 239-256.
[12] See Hood 1960, pp. 166-176.
[13] See Pelon 1976.

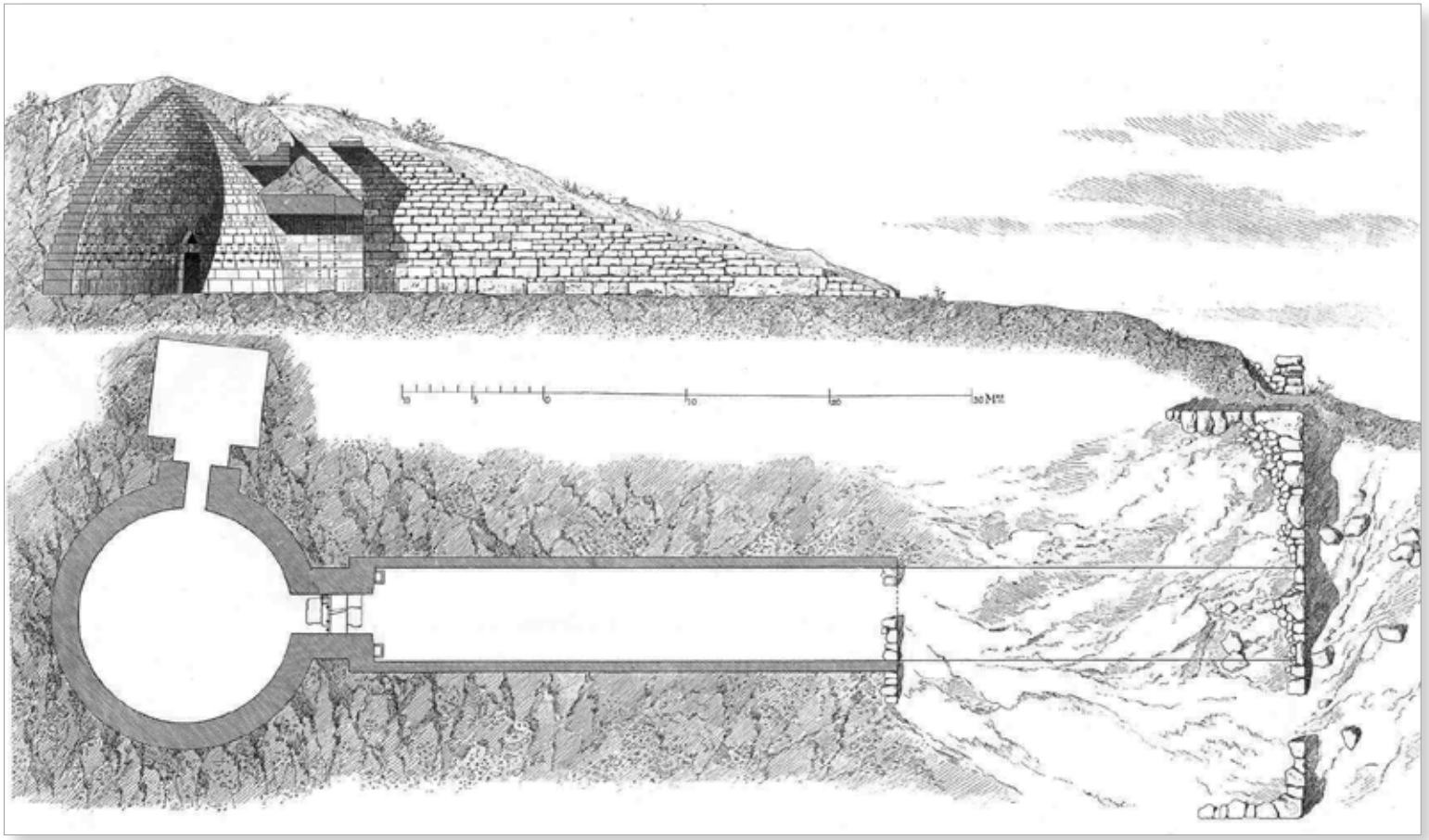


Fig. 8: The tomb of Atreus, Mycenae (plan and section by W. Dörpfeld).

description of the form and construction of a Mycenaean *tholos*. Although there are, naturally, many differences among the almost 200 *tholoi* known to date, they do have several features in common, most remarkably the highly standardized bee-hive shape (Fig. 8). They are all made of local stone (not always clear if dry wall or if it includes some clay binding mortar, though the latter is far more plausible). They consist of a passage that gives access to the tomb proper, *dromos*, the entrance doorway, *stomion*, and the main chamber, *tholos*. They are cut into the rock of a hillside, as a rule, starting with the *dromos* (6 x 36 meters long in the case of Atreus) and widening immediately after the *stomion* to create the large circular cavity that will hold the *tholos* proper (Fig. 9). The length of the *dromos* varies, but it seems to have been calculated so the level of the lintel at the entrance corresponds more or less to ground level; this facilitates the positioning of the huge and very heavy lintel stones by pulling them into place (the lintel stone at the Treasury of Atreus weighs 120 tons). The construction of the *tholos* within the cavity of the rock requires an enormous amount of stones. Usually they are rubble or roughly dressed, elongated, with their narrow sides looking inwards and kept tightly in place by smaller stones in the form of wedges. A small number of monumental *tholoi* are constructed with ashlar stones. Two such *tholoi*, the Treasury of Atreus and the tomb of Clytemnestra, had ornamental façades at the entrance carved in stone. The dome is built in courses (rings) each one slightly projecting inwards (corbelling) and the top is sealed with a large capstone placed over the uppermost ring. That which remains distinctly standard in all the *tholoi* is the bee-hive shape and the ratio of approximately 1:1 between

Fig. 9: Views of the interior of the tholos tomb of Atreus, Mycenae.

the inner diameter and the height of the *tholos*.[14] The size of the *tholoi* varies: they seem to fall into three categories: diameter under 6 meters, between 6 and 10 meters, and over 10 meters. The largest is the tomb of Aigisthos, made of rubble stones (13.95 m), and the Treasury of Atreus made of ashlar (14.5 m). These dimensions are unmatched in the history of technology and were only surpassed when the true dome was invented, many centuries later.

A vulnerable point in this construction is the break at the entrance. The doorway is wide and tall and the walls framing the opening are very thick and taper inwards at the upper level (Fig. 12). The lintel consists of one or more large stones. Nevertheless, they can hardly cope with the enormous loads of the masonry above; to solve this problem, the Mycenaeans invented the 'relieving triangle' based on the idea of the corbelling (Fig. 10). Such a triangle above the lintel helps divert the loads to the massive walls framing the entrance (Fig.11). The triangular gap is closed with an upright slab or a stone wall.[15]

A typical feature of all *tholos* tombs is the earthen mound sealed with a water-proof layer of well-packed clay that covers the part of the stone structure projecting above ground and seals the *dromos* and the *stomion* (Fig. 12). The *tholos* tomb is thus virtually hidden under the tumulus. The mound itself and sometimes a marker in the form of an upright slab (*stele*) on its top are the sole indicators of the material wealth and the technical ingenuity that lies below. Many *tholoi* still stand more or less intact, but sadly all but four have been looted.

An effective yet elusive structural system

Despite the large number of known *tholoi* and the excellent preservation of many, the structural system that provides their stability and endurance to this day remains an open question. This is due to: the absence of detailed documentation drawings but for a few; the inefficient knowledge of a crucial part of the structure, that of the wall behind the visible interior of the *tholos*; damage or deformation of the walls in several cases; and the lack of thorough technical knowledge and relevant analytical tools in order to approach this issue in depth.

Since the 1980s, however, engineers have joined forces with archaeologists in an effort to understand the structural logic of these magnificent structures that rival our modern technical skill. *Tholoi* are now examined on purely technical grounds using calculations, computer simulations and structural analysis. Ambiguities, nevertheless, still exist; not so much regarding the method of construction – this, strangely enough, can be described fairly well – as the structural model that keeps these very large *tholoi* standing to this day, 3,300 years after erection. Two theories have been put forward: the *corbelling theory* and the *horizontal ring theory*. The former is more widely accepted.[16]

According to the *corbelling theory*, Pelon, Cavanagh-Laxton and others,[17] forces work in the vertical. Because the forces operate vertically through gravity there is no need for buttressing devices to counteract horizontal forces; and because the forces operate through compression, corbelling can be achieved with a rubble stone structure. In this case, courses should be horizontal (as seems to be in most *tholoi*). The impressive standardization of the shape of all the *tholoi* in the form of a bee-hive is an argument in favour of the corbelling theory, for this shape corresponds well to vertical forces of gravity (Fig. 13). If it were the ring effect, on the other hand, there would have been no need for this standardization. Corbelling, above all, was well known

[14] On proportions see: Kamm 2000, pp. 19-71.

[15] The Tomb of Aegisthus is an interesting case in this regard. Wace was convinced that it had no relieving triangle and this was strongly embedded in the relevant literature. In 1997, however, during consolidation work on the monument, the triangle was revealed. Galanakis recently discovered in the Evans archive in the Ashmolean Museum unpublished drawings and commentaries by A. Evans and D. Mackenzie, written in 1924, on the existence of a triangle (Galanakis 2007, pp. 249). Actually, this is clearly visible on the inner face of the wall.

[16] For a general discussion on the history of research see Cavanagh & Laxton 1981, pp. 109-111.

[17] Cavanagh & Laxton 1981, pp. 109-140. Cavanagh & Laxton 1988, pp. 385-395.

to the Mycenaeans and was applied to many structures, such as the galleries at Tiryns, the Lion Gate and some bridges still standing.

The *horizontal ring theory* was proposed by Santillo and Santillo Frizell[18] and presupposes that the stones are very tightly built and compressed so as to overcome the tendency to fall inwards. Two factors are important in this respect for they add to compression: a) the earth piled over the dome (a standard feature in all *tholoi* but only for the upper part of the structure since the lower part is built within the rock cavity) and b) the oblique placement of the stones that adds to compression through gravity (a feature rarely attested with certainty because of the lack of visual contact with the back of the wall and the deformations which are common and can be misleading). In the ring effect the entrance (*stomion*) is a weak point as it introduces a dangerous break to the ring. This problem is overcome by friction provided by the huge masses of masonry framing the entrance. An argument against the ring theory is that far too many *tholoi* are partially preserved with large parts missing. Had their stability relied on the ring effect they would have collapsed entirely. The structural models described briefly above present issues that can be resolved only through systematic analysis based on safe, adequate and detailed data. Could it be possible, for example, that *both* theories are correct: the lower part of the *tholos*, up to the level of the lintel, based mainly on corbelling, and the upper part based on the ring effect? It is clear that the detailed documentation of the largest number possible of *tholos* tombs – a documentation that will require experts, since this is a task that involves a large amount of interpretation – is a matter that needs to be given priority in the future.

One thing is certain: the construction of a *tholos* tomb required the mobilization of considerable resources and expertise that were most probably commanded by the palace, as indicated by tablets dealing with personnel. An attempt to evaluate and calculate such an operation for the largest of all, the Treasury of Atreus, offers an interesting insight into the scale of such technical work.[19] Preparation work involved cleaning an area of 3,000 square meters and removing 5,000 tons of soil, an enterprise that required 1,250 man-days. The next stage, quarrying away the bedrock, would produce 3,500 cubic meters of debris (3,000 man-days). 3,000 tons of conglomerate stone were then quarried and transported to the site. The huge lintel, carried by

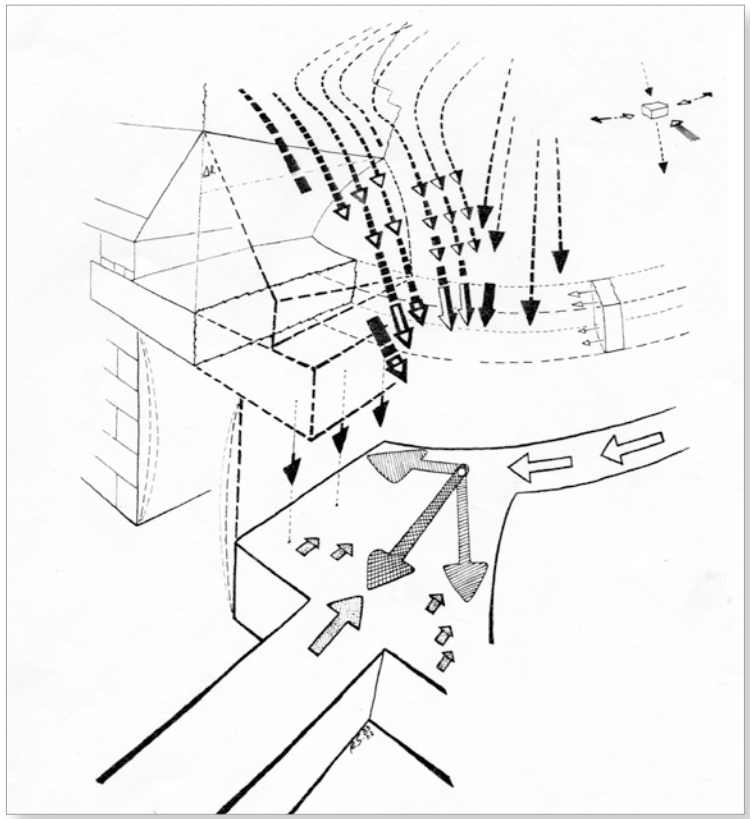
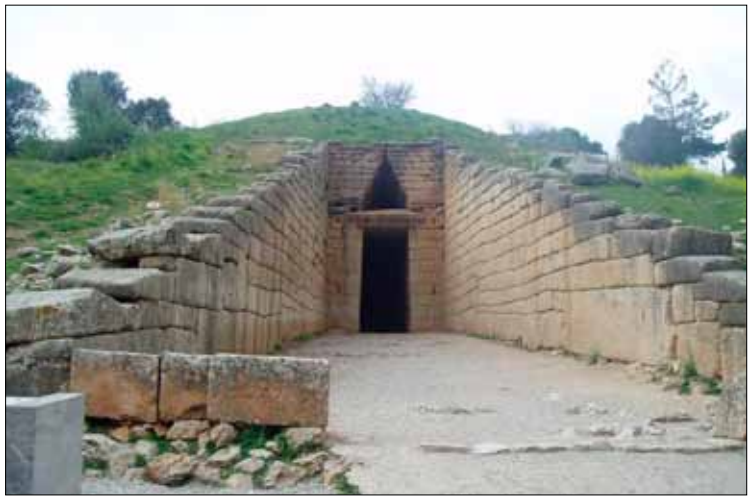


Fig. 10: The structural function of the relieving triangle (after Frizell and Santillo).

Fig. 11: The relieving triangle above the entrance.



[18] Santillo Frizell 1998, pp. 625-631. Santillo Frizell 1997-1998. Santillo Frizell & Santillo 1984, pp. 45-52. Santillo Frizell & Santillo 1988, pp. 443-446. Santillo Frizell 1988, pp. 234-235.

[19] Mee & Cavanagh 1999, pp. 93-101.

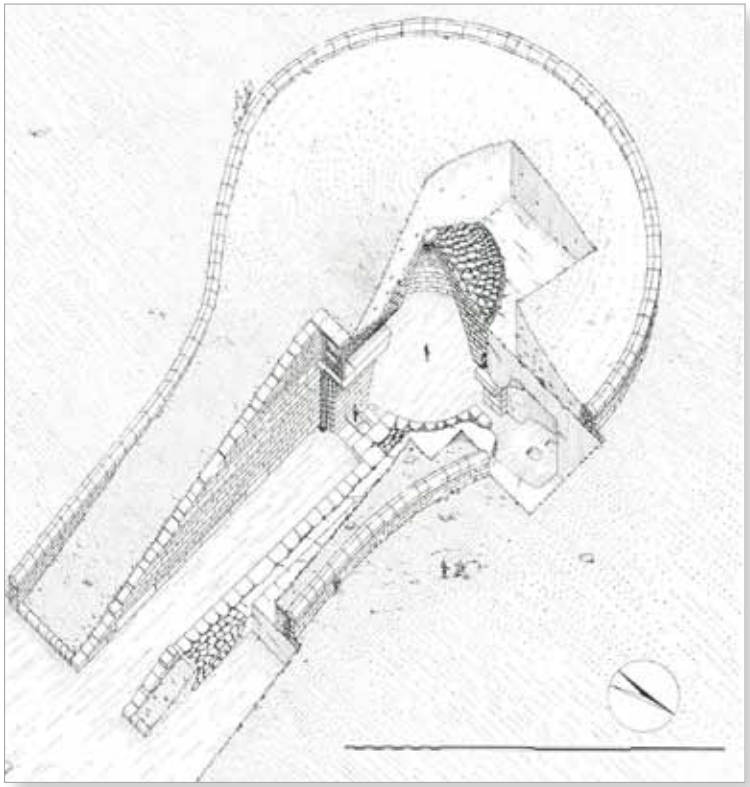


Fig. 12: The tholos tomb and the tumulus: an isometric reconstruction (after S. Hood).

sledge by 1000 men, would take two days to transport from even not very far away, and so on. All in all, it is estimated that the operation would require 20,280 man-days, not including specialists for bronze work, carpentry and supervision. If we assume that 30 men worked simultaneously on a daily basis, then the whole operation would have taken at least 2 years to complete.

The origins of the Mycenaean tholos

The highly sophisticated technology of the Mycenaean *tholoi* demands an explanation: are they the outcome of a local evolution (in which case there should be some sort of a local predecessor) or are they based on technology imported from outside the Mycenaean world (in which case we should seek for predecessors elsewhere)? Both theories[20] have been put forward: the former is based on the earlier tradition of tumuli and grave circles (these are cist graves set within a circular boundary made of a low stone wall, with no earthen mound on top). Yet, the earliest *tholos* appears in a region (Messenia) that has no such tradition. The second theory points directly to the circular tombs in Crete, mainly in the Messara region.

The relationship between the Mycenaean world and that of Minoan Crete, with a diffusion flow pattern directed from Crete to the mainland, is well attested in many instances. An argument in favour of this view is that the archaeological finds in the earliest *tholos* tomb at Peristeria, Messenia, show strong connections with Minoan Crete.[21] Those who object to this theory emphasize the following points: a) there is a large chronological gap between the two, though it now appears that circular tombs were still used (if not built) in Crete when the first Mycenaean *tholoi* were constructed; b) the Cretan tombs were built above ground whereas the Mycenaean are largely underground. New findings, however, show that this rule has a few exceptions; c) in Crete there are no earthen tumuli, no entrance corridors, the entrance tends to be characteristically small, and so on. A serious drawback to this comparison is the fact that the Cretan circular tombs are badly preserved, which makes it difficult to conclude with certainty on their upper form and structure. On the other hand, the very fact that they have all collapsed, although smaller than the Mycenaean, may be taken as an indication that the structural model differed.

The most common theory, however, combines the traditions of the two places: the Mycenaean *tholos* may represent the merging of a mainland tradition of burial below ground in pits, cists, and small chambers set into a low round tumulus, and a Minoan tradition of burial above ground in large circular tomb chambers with corbelled side walls. However, even if the form and the main structural elements have much in common, the structural ingenuity of the Mycenaean *tholos* in all its details is surely a local achievement.

A final note regarding the quest for origins, is that they go back to the first circular tombs ever to appear in the Aegean region. Such a question can never really be resolved; forms and technology travel around among people in close contact, and engravings produce endless hybrids. Moreover, people can just as well come up with similar ideas and techniques on their own. The

[20] For a general discussion and bibliography on Mycenaean *tholoi* see Rutter 1993, pp. 745-797.

[21] Ιακωβίδης 1966, pp. 98-111. In the Peloponnese, in the region of Messenia, a number of tombs cut in the rock – known as rock cut chambers – were found imitating the characteristic bee-hive shape as well as other details of the tholos tombs. This is also the area were the earliest *tholos* tomb is attested, around 1,600 BC, at Peristeria. The tomb has yielded archaeological finds that relate the owner of the tomb to Minoan Crete.

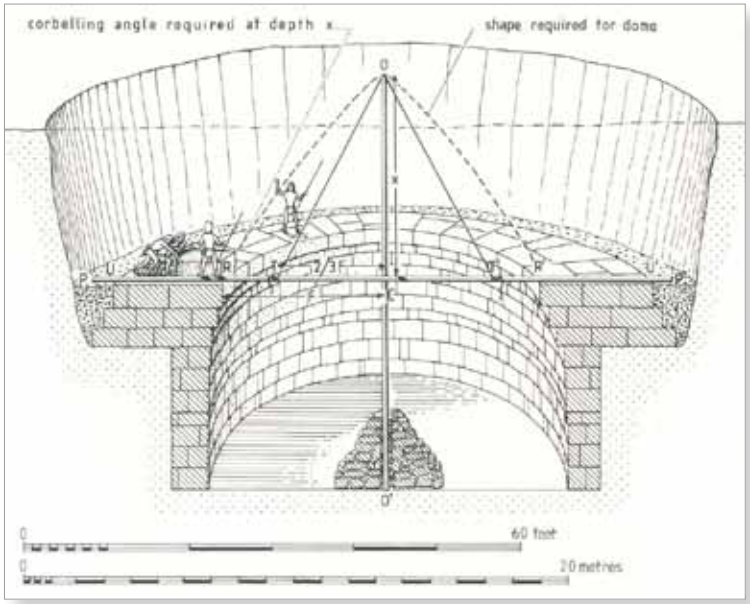


Fig. 13: Checking the bee-hive shape during construction (after Cavanagh and Laxton).

inhabitants of the Aegean and the Greek mainland always built kilns and granaries of a similar form and therefore had acquired a relevant sense of the stability of the dome, albeit on a much smaller scale. This 'diffusion anxiety syndrome', as I have labelled it, need not exhaust us. What is interesting, to my understanding, is the almost exclusive and recurrent use of the circle for funerary architecture. Some believe that this refers to the primordial form of a 'house', the circular hut (why not the cave also then?).[22] Somehow, I do not find this so convincing for the rectangle was attached to the idea of the house just as strongly and just as early (see for example, the 'house-tombs' in Crete, built at the same time as the circular ones in other parts of the island). It is the symbolic power of the circle and the dome as forms per se that can better explain such a choice along with the 'exclusiveness' of the use of this shape for funerary practice.

Such a connotation is of a far more abstract nature, but man, after all, is primarily a maker of symbols.

[22] Baldwin Smith 1951. See also Flannery 2002, pp. 417-433. According to latest research, sedentary life in many parts of the ancient world began with settlements of circular huts like those of the preceramic Near East.

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Populonia, Tomb of the Chariots, external views of the *tumulus*

Tholos tombs in Etruria

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The Etruria of the first millennium BC saw the influence exerted by civilizations occurring in the eastern basin of the Mediterranean becoming increasingly pronounced in funerary architecture, making it one of the most interesting regions of the Mediterranean (Fig.1) in terms of the relationship between East and West.

It was previously assumed that Etruscan architecture was influenced by domed roofs known in the megalithic period, affecting already the eneolithic period and various Mediterranean cultures in later ages, until the *nuraghe* of Sardinia and Corsica (Figs. 2-3) and the *tumuli*[1] of Mycenaean Greece as described in the Homeric poems and well known archaeologically (see before Clairy Palyvou, *Prehistoric dome architecture in the Aegean*). These influences seem, however, no longer to have any foundation and it belongs instead to a distinct tradition (Karageorghis 1967, pp. 121 ss.), although a part of the scientific community does opt for a direct influence being exercised by the people of Corsica and Sardinia on the technical use of the shell of *tumulus* tombs, and, in more general terms, on the idea of stone architecture (Colonna 2000, pp. 255 ss.) with rooms covered by a dome or pseudo-dome.

The tumulus tombs

The case of a series of chamber tombs at Populonia (Figs. 3 and 4) dating from the end of the 9th to the 8th century BC is emblematic already in the first Iron Age (9th-8th century BC) in a comprehensive view of incinerations characterizing a large part of the burials of the Italian peninsula. Urns are placed within wells: the tombs are constructed on an elliptical or almost circular plan (with a pseudo-dome made of limestone slabs arranged in jutting rows and set on the floor of the cell) and a *dromos* bordered by stone walls (Bartoloni G. 2000, pp. 19 ss.). The architectural allusion to the cabin is obvi-

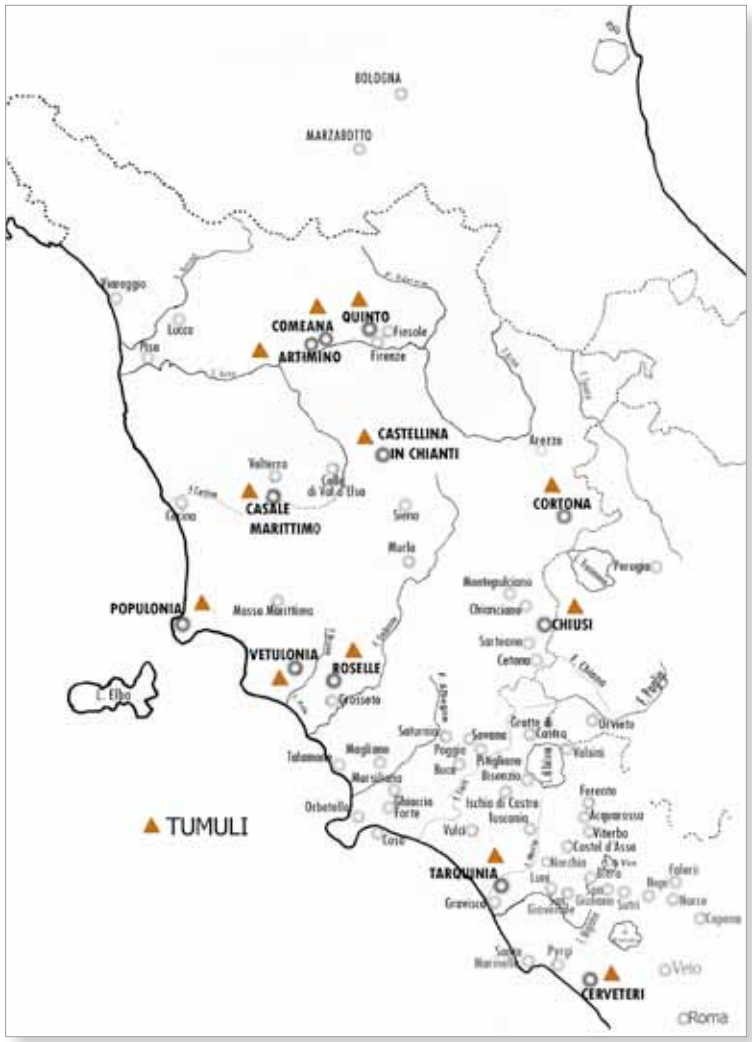


Fig. 1: Map of Etrurian sites

[1] *Tumulus* is mound and the plural *tumuli* is mounds

Fig. 2: Tholos of the tower of the ancient *Nuraghe Palmavera*

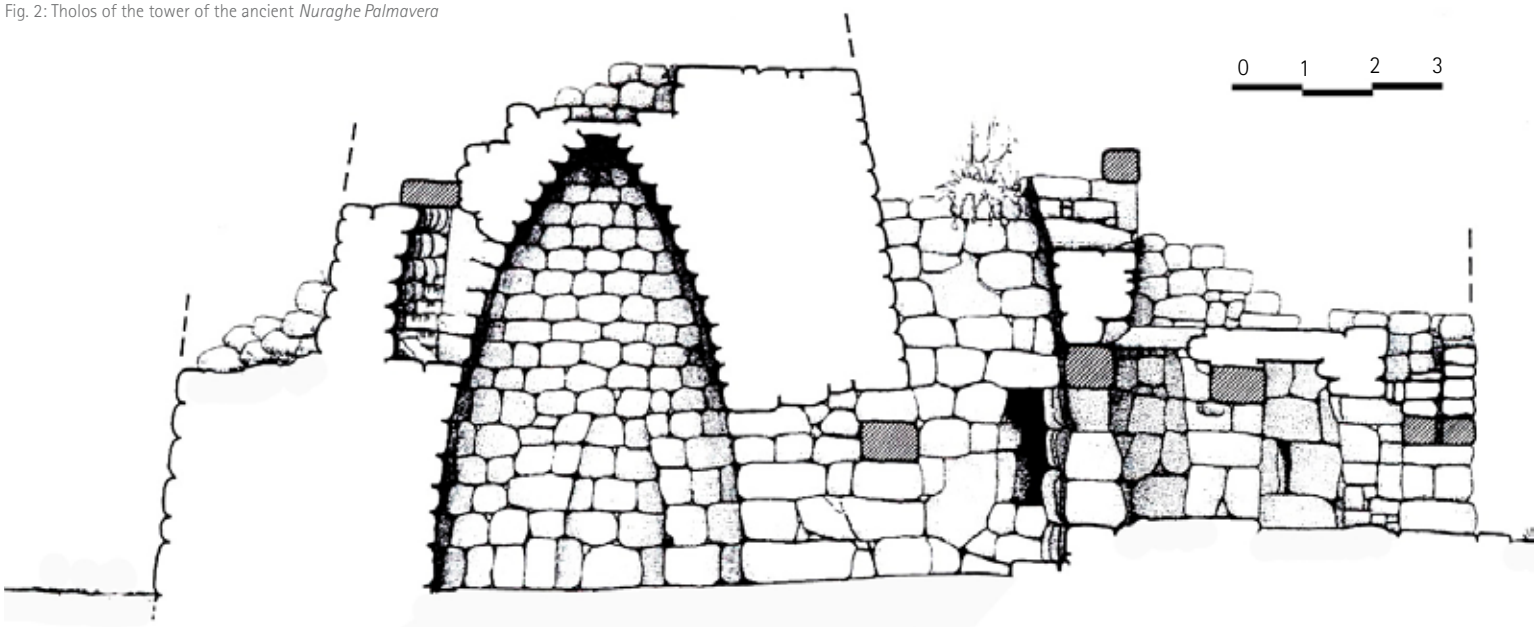


Fig. 3: Populonia, *Poggio alle Granate*, chamber tomb *del raggio lunato di bronzo*

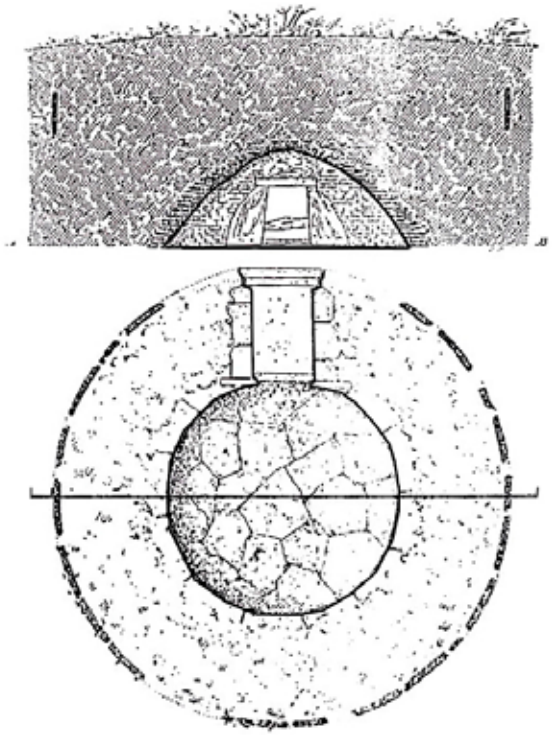


Fig. 4: Populonia, *Poggio alle Granate*, tomb *Cmera 1*

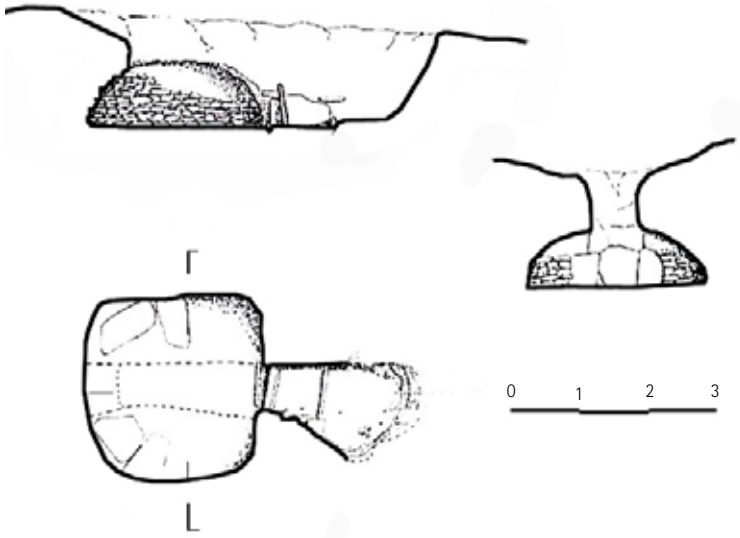


Fig. 5: Hut urns from Vetulonia and Tarquinia (from Rasenna)

ous: in the same way in some southern communities of Lazio until Vetulonia, high ranking personalities were choosing cabin huts (Fig. 5) to deposit the ashes of the deceased, (Bartoloni G. 1987) in Populonia stone buildings mirroring royal houses were used.

The earliest examples

In Etruria the *tumuli* are, from the 8th century BC, the most widespread form of tomb, designed to fill pit tombs, becoming actual *semata* (indicating marks). These monumental forms were the most common type of burial in Anatolia from the 8th century BC onwards, as the discoveries made in Frigia in recent decades seem now to suggest. In Anatolia this kind of structure was a genuine innovation compared to previously: if the model of the chamber tomb can be found earlier in the Urartic area, the *tumulus* as a *sema*, visible from all over the surrounding territory, is the real ideological innovation of this architecture. We may understand their spread and the need to show the 'kingship' of the deceased through this model.

The so-called 'Midas Mound' in Gordion, a tumulus 50 meters high and 250 meters in diameter, is an example. Without *crepidine*[2] and entrance *dromos*, this enormous mound, restrained by radial walls, covered a small burial chamber, off-center to discourage attempts at intrusion. The burial chamber, built for a single depositional event, given the impossibility of reopening, was made of wood.

In the architecture of the first millennium BC these tumuli marked the beginning of a new concept of construction in the eastern Mediterranean basin which was not slow in spreading west, although at present it is not possible to make direct comparisons between Phrygian and Etruscan tombs.

The 'orientalizing' period

The transformations taking place in Italy between the end of the Iron Age (9th-8th century BC) and the period of splendor that characterizes the 7th century BC, conventionally defined in Etruria under the term 'orientalizing', open the doors to new contacts with Greece and, above all, with the people of the nearby eastern Mediterranean.

The emporiums and ports of Syria and Cilicia (Al Mina, Tell Sukas, Tarsus) suffered a setback in the second half of the 8th century BC after the conquest of Palestine, Syria and Cilicia by the Assyrians. Phoenician merchants and sailors of Eubea sought new markets and new areas to exercise their trades and for the supply of metals in particular.

Fig. 6: Cerveteri, necropolis of *Banditaccia*, *Tumulus* del *Colonnello*

Fig. 7: Cerveteri, necropolis of *Banditaccia*, *Tumulus II*

[2] The crepidine (krepis) is an element of classical architecture. In general indicates the basement or the plinth of a building (eg a greek temple). You may get the crepidine under an altar, a platform or even the simple step of a sidewalk can be called 'crepidine'.

Fig. 8: Vetulonia, Tomb of *Diavolino II*, plan (from Buffer 2000)

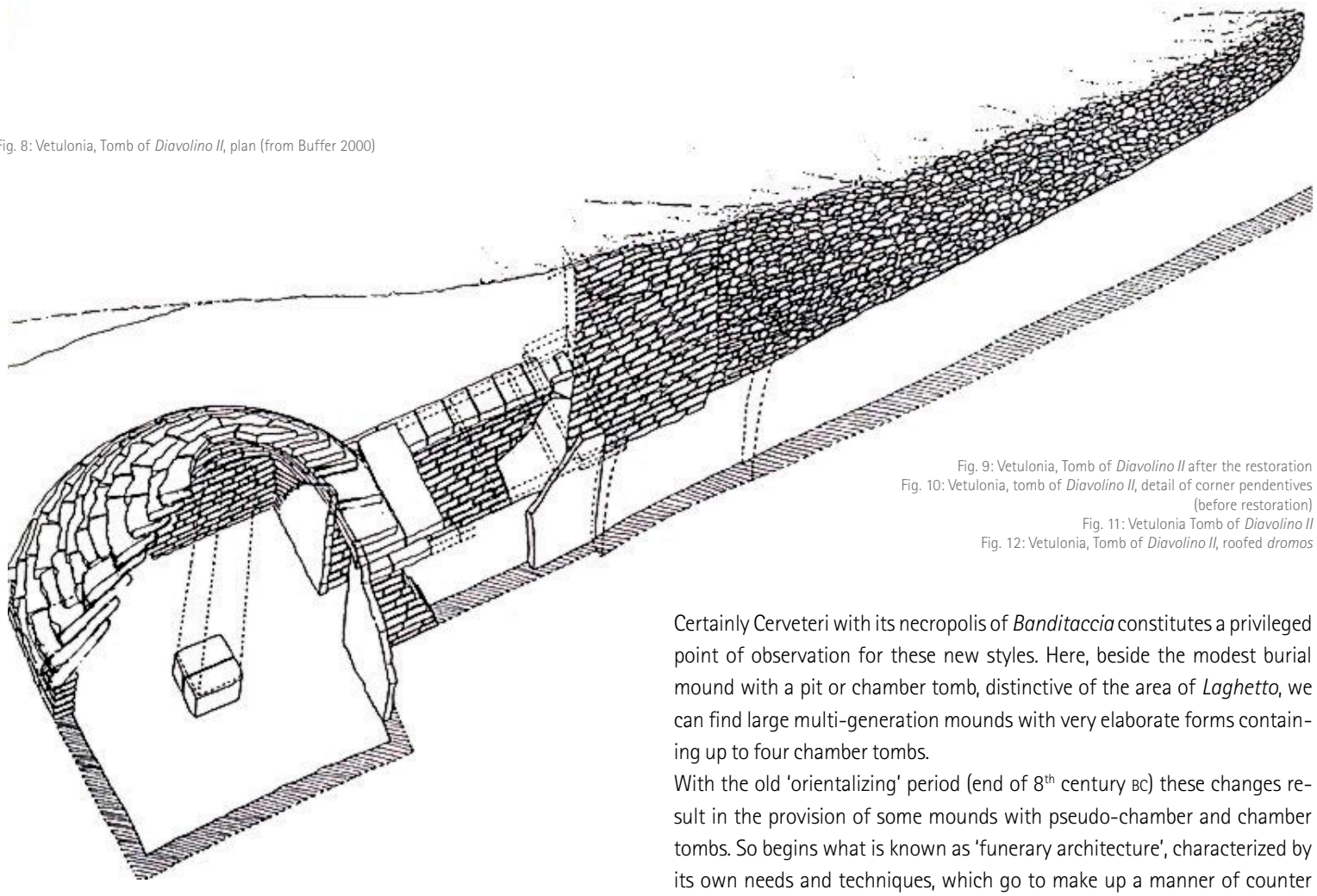


Fig. 9: Vetulonia, Tomb of *Diavolino II* after the restoration
Fig. 10: Vetulonia, tomb of *Diavolino II*, detail of corner pendentives (before restoration)
Fig. 11: Vetulonia Tomb of *Diavolino II*
Fig. 12: Vetulonia, Tomb of *Diavolino II*, roofed *dromos*

While the western routes traveled by the Phoenicians appear to follow the North African and Sardinian coasts as far as the Iberian and the Atlantic coasts, with regard to the control of sources of metals, those of the Eubean people were oriented to the Tyrrhenian coast of southern Italy and southern Etruria.

The new funeral rituals which flowed into Etruria, and to several Italic communities from contact with those people coming from the Near East and Greece, determined the requirement of enlarging tombs in new and wider spaces with a functional organization for the deposition of rich and heavy funerary objects. Heroic Homeric funeral rituals are assimilated as the most convenient indicators of the rank of the deceased as 'hero', while new symposia forms are also highlighted by the presence of the Greek tradition in funerary pottery.

Certainly Cerveteri with its necropolis of *Banditaccia* constitutes a privileged point of observation for these new styles. Here, beside the modest burial mound with a pit or chamber tomb, distinctive of the area of *Laghetto*, we can find large multi-generation mounds with very elaborate forms containing up to four chamber tombs.

With the old 'orientalizing' period (end of 8th century BC) these changes result in the provision of some mounds with pseudo-chamber and chamber tombs. So begins what is known as 'funerary architecture', characterized by its own needs and techniques, which go to make up a manner of counter architecture parallel to the urban, and indeed often more important in terms of commitment and expenditure.

The chamber tomb is primarily individual, as was usual for pit tombs, then became 'dual' to accommodate the remains of *pater* and *mater familias* and later multiple, for a long time reserved for a relatively small number of consanguineous relations. A practical entrance, although sealed by stone slabs, facilitated reuse.

The oldest tombs have the appearance of larger or smaller rectangular or square pits, with rounded corners, recessed into the ground and covered with masonry blocks jutting out gradually to build a pseudo-vault. In the pseudo-chambers the use of a wooden floor boarding is frequent.

However, subsequent developments seem to be influenced by the type of coverage: the pseudo-vault tends to extend the internal space by becom-

ing a sort of corridor: The most famous of these is in the *Regolini Galassi* tomb at Cerveteri. A roof made of stones and earth to consolidate the elements, and also to build up a sort of *sema* or *monumentum*, is a regular feature. The morphology of the land of southern Etruria allowed the building of sepulchral spaces by excavating into the soft rock to make underground chambers, which do not differ in form and section to those actually built or half-built.

This kind of architecture is established early on in southern Etruscan centers such as Cerveteri, already at beginning of the 7th century BC, adopting elaborate boundaries outside the *tumulus*, the crepidine, with frames carved into the soft *tufo* (tufa) as in the necropolis of *Banditaccia* in the *Tumulus* of the *Colonnello* (Fig. 6) or in the *Tumulus II* (Fig. 7).

To date, this is the most ancient architectural stone decoration known on the Italian peninsula, predating in ancient times even the tombs of contemporary Greece and Anatolia. We may make an apt comparison with the stone bases of wooden columns in Zinçirli or Tell Taynat in northern Syria, if we accept, as the scientific community is doing, that such models arrived in Etruria and firstly in Cerveteri through that flow of workers arriving in Etruria after the Levantine diaspora of peoples (Phoenicians, Syrians, Cypriots, Anatolian), who were pushed west by the Assyrian invasion of Sargon II (722-705 BC). These workers were responsible for not only the architectural innovations, but also for the instigation of the earliest monumental Etruscan statuary.

In this innovative mix of experience coming from the Near East we must remember the contribution provided by these people even in the artistic productions of luxury items (toreutics, metallotechnics, jewelry, etc.), so appreciated by the new Etruscan social group of «princes» who modeled their way of life on the eastern Satraps.

Only in Etruscan territory have these architectural elements been so well adapted to the original structure of the mounds: the arch doors, which are common in entrances of tombs of the ancient and medium Orientalizing period, drew inspiration not from the tradition of the First Iron Age but from earthen masonry structures in the area of northern Syria. If the impetus for the creation of these monuments seems to come from the East, that which is typically Etruscan remains the adaptation to the monumental structure of the specific spaces of religion ; a possible example being the kind of podium attached to the mound as a rampant arch for surmounting the perimeter ditch, acting as access to a platform for acts of worship (Fig. 7).

The constructed mound

These architectures, the expression of such aristocratic groups at the head of the orientalizing wave of culture, transmigrate at the middle of the 7th century BC from southern Etruria to the north, especially to Vetulonia (Figs. 8-9) and Populonia, where the first small mounds of the Villanovian age are to be found and the wholly built mound was constructed. The exclusively square plan represents a rationalization of previous curvilinear or rectangular designs, gaining useful space particularly after the adoption of the ritual of inhumation.

The roof remains a pseudo-dome with a system of false pendentives (Fig. 10), which recalls the adaptation from the testudo roof moving from oval-shaped structures to the rectangular. In Vetulonia (Fig. 12), where we can see the first monumentalizing of this architectural type, a central pillar was used to support the closure slab of the dome, a solution statically not essential, which seems to have been suggested by the central furca of huts.

Other special features are the location of the grave in the center of the mound with a single chamber, rarely accompanied by cells, on a *dromos* with a plain roof tunnel, and an outer closing stone slab as for the chamber (Fig. 11). The walls of the chamber (Tomb of *Diavolino II* and upper Tomb of *Pietrera*) are made from small square sheets connected to the pseudo-vault, made from jutting out slabs through corner pendentives to discharge the weight.

Inside the room there were stone funerary beds with decorated legs in the most elaborate form in the tombs of high-ranking personalities such as that of *Pietrera* in Vetulonia, which is also known for the series of eight stone statues most likely representing the ancestors of the family and spread along the *dromos*.

It must be noted that in this tomb the older grave, the lower, collapsed for some unknown reason a few decades after its construction in the mid-7th century BC and was reconstructed on top using different materials, omitting the creation of a central pillar, as is always the case in the mounds of Populonia.

In the latter place, the size of the tombs is much more modest, but made with care using *panchina* or *alberese* (local limestone), in the domes and exposed parts (Figs. 13-17).

The cap is not accessible and, due to the absence of a *podium,* a pronounced overhanging stone eave (Fig. 15) is developed for the outflow of rain. The access to the *dromos* is not hidden, but shown by a projection of the *tamburo*

or by the interruption of the paved sidewalk that surrounds the base of the mound (Fig. 14). The pavement can also be identified as a symbolic threshold to the house of the dead, as in the ditch in the *tumuli* of Cerveteri.

The door of the *dromos* is the focal point of the monument, marked by a paved square area before the projection of the *tumulus* as that of Tomb of *Pissidi Cilindriche* (Fig. 16) or by the two great pillars at both sides of the door, as in the tomb of *Flabelli*. Little wonder then if the use of the chamber is maintained for several generations through a rigorous identification of the *tumulus* and of the tomb inside. In the context of relations between East and West it does not seem misleading to recall the cenotaph of Menekrate on the Island of Corfu, dating from the end of the 7th century BC, that recalls very closely the shape and dimensions of architectures in Populonia.

Even though we still do not have wide archaeological evidence, the environment of Anatolia and in particular the extensive royal cemetery of Bin Tepe around Sardis, the capital of Lydia, offers suggestions for further contact with the Etruscan funerary architecture of the end of the 7th century BC. Cerveteri is again a point of observation for the phenomenon: architectural styles develop in such distant areas at the late 7th century BC and transmigrate with workers from Ionia, perhaps from Sardis itself, in the Etruscan area: we can observe marked similarities between the two environments highlighted by the use of elaborate crepidini built with limestone blocks and toro on top, strongly related, for example, to the top of the great *Tumulus* of *Sorbo* at Cerveteri.

It is noteworthy how in Roselle, an Etruscan settlement, at the middle 7th century BC at the confluence of two hills, where later a Roman Forum was to rise, there is a unique complex of houses, interpreted as a ceremonial and political center of the community, consisting of a building with a double fence built with bricks and raw clay resting on a beaten clay layer. The main building has a circular chamber, externally rectangular and internally circular (diameter 4.5 meters), with a bench and a threshold. The inward slope of the walls and the definite absence of tiles seems to confirm the hypothesis by some scholars that the roof was covered by a brick pseudo-dome finished with litter or tablets, perhaps supported at the center by a wooden pillar: a real *tholos* such as is already seen in the Villanovian age at Populonia and as those characterizing the funerary architecture of northern Etruria near the sea during the 7th century BC.

By the end of the 7th century BC the success of this kind of tomb is con-

Fig. 17: Populonia, Tomb of the Chariots, internal views of the tomb

Fig. 13: Populonia, Tomb of the Chariots, external views of the *tumulus*
Fig. 14: Populonia, Tomb of the Chariots, external views of the *tumulus*
Fig. 15: Populonia, Tomb of the Chariots, gutter
Fig. 16: Populonia, Tomb of *Pissidi Cilindriche*

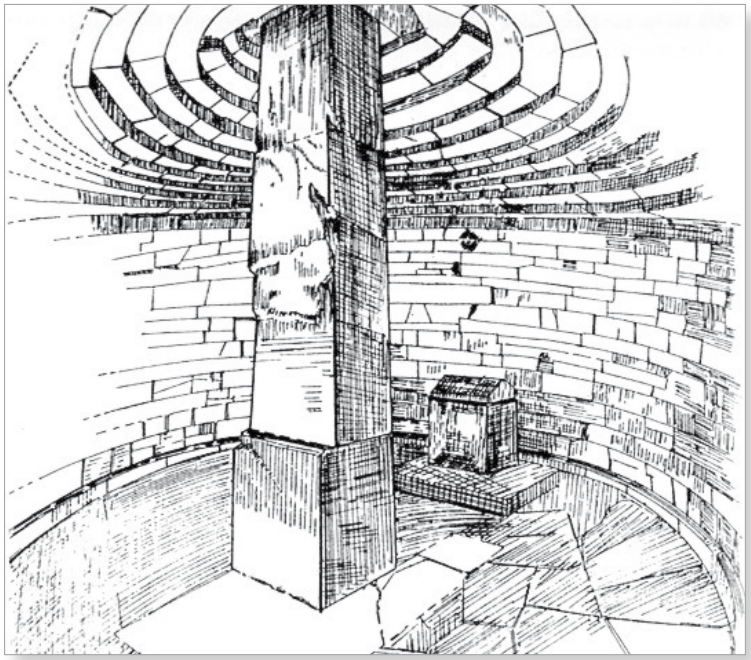
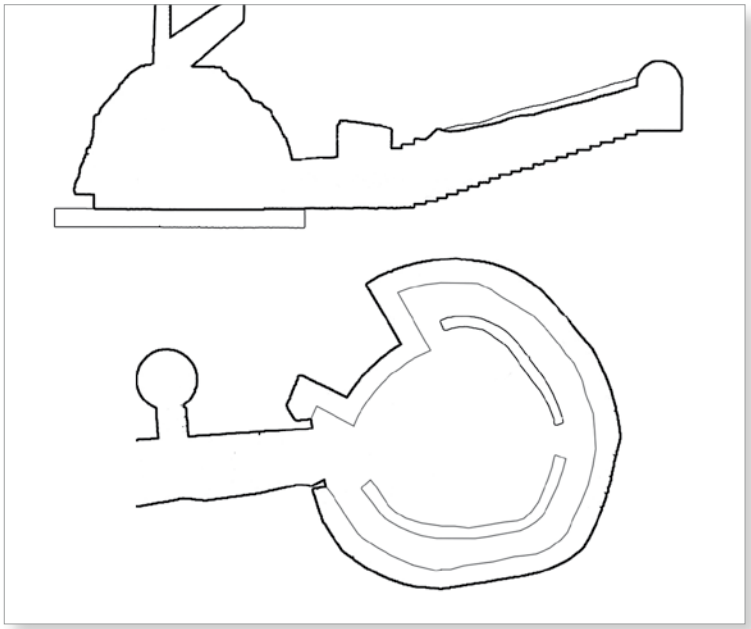


Fig. 18: Tomb of Casale Marittimo, internal layout and view of the tomb
Fig. 19: Quinto Fiorentino, Tomb of *Mula*, plan (from Tampone 2000)
Fig. 20: Quinto Fiorentino, Tomb of *Mula*, view of the chamber



solidated in northern Etruria: the chamber tomb also conquered areas such as Chiusi and especially internal Etruria, previously reluctant towards these architectural forms. Rectangular chambers roofed with pseudo-vaults were rising with giant *tumuli* in Cortona, Castellina in Chianti and Comeana.
In the same way, in the middle Valdarno and in the area of Volterra the circular *tholos* with a corbelled dome such as that of *Casale Marittimo* (Fig. 18) or those of the more magnificent *Mula* (Figs. 19-20) and *Montagnola* near Florence (Fig. 21) or of *Montefortino*, (Fig. 22) became the fashionable architectural type: testament to the tangible riches of the heads of the Etruscan communities of *Oltrarno,* who controlled the roads that converged there from Vetulonia and the Chiana Valley towards Bologna.
From an architectural point of view, the Tomb of *Mula* appears to be the earliest of the profile which starts directly from the floor and spreads to a height of approximately the radius of the base, and also for the absence of a central pillar and *vestibulo*, these characteristics deriving from the Villanovian experience as in the *tholos* of *Poggio Granate* in Populonia, already cit-

Fig. 21: Fifth Fiorentino, Tomb of *Montagnola*, plan (from Tampone 2000)

ed. On a circular plan, it is built with limestone slabs (*alberese*) in horizontal layers, with lintels of vertically oriented slabs.

In other tombs we may observe that a height reaching almost the value of the diameter is associated to a central pillar. If the reason for the pillar comes from the experience of Vetulonia, the cruciform plan of the *vestibulo* of the Tomb of *Montagnola* recalls the tombs of internal Etruria.

It is obvious that the connections between Etruria and the eastern Mediterranean do not confin themselves merely to funerary architecture, given the similarity found by scholars between Etruria and Asian Ionia for domestic architecture, from architectural coroplastica[3] to funerary symbols and burial statues of lions, to mention just some examples, demonstrating the complexity of these contacts which are positively and constantly expanding our knowledge.

Imitators

The upheaval of the 6th century BC in Etruscan society, determined by the rise of oligarchies to rule the Etruscan cities instead of the 'princes' of previous generations, brings new funeral rituals and new funerary architectures which are articulated with different organizations and forms according the different areas: from the tombs like houses in Tuscania, or as cubes in Norchia and San Giovenale, to the more rational and less cumbersome, such as the *aedicula*[4] tombs of Populonia

In other areas of northern Etruria near the sea as in Roselle (Fig. 23) and Vetulonia (Fig. 24) we may see small rectangular chamber tombs with a short *dromos*, built inside a mound and covered with diagonally jutting out slabs, without pendentives in the corners, and a depositional bench formed by vertically laid slabs. This was a legacy of the great tholos architecture, which had by then given way to new architectural forms.

Conclusions

The similarities found between sepulchral monuments located in different areas of the Mediterranean offer us the opportunity to recognize those individual influences on funerary architecture imported by workers driven west under Assyrian pressure at the end of the 8th century BC (North-Syrians, Anatolians, Cypriots), and later Ionian people in Asia emigrating west during the 6th century BC away from Persian invasions.

[3] Processing technique of pottery in the archaeological field. *Khora* from the greek, meaning earth, and *plastica*, meaning shape.

[4] An *aedicula* (plural *aediculae*) is a small shrine. The word *aedicula* is the diminutive of the Latin *aedis* or *aedes*, a temple or house; thus, an *aedicula* is literally a small house or temple.

Fig. 22: Comeana, Tumulus of *Montefortino*

The low number of mounds studied in those areas limits the precise reconstruction of the flow of contacts, especially for the 7th century BC, although the scarce evidence indicates cultural and technical routes already travelled. An increased concentration of investigations in those places, therefore, could fill the gaps in our knowledge of the 7th century BC, since we can now benefit from evidence mainly prior to this period with the series of Phrygian mounds and later with the known examples in Asian Ionia (Sardis).

Fig. 23: Roselle, *Campo della Fonte*, tomb chamber.
Fig. 24: Necropoli of *Val Berretta*, (Castiglione della Pescaia) chamber tombs
Fig. 25: Populonia, Tomb of the Colatoi, internal view

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